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(54) Railway joint.

(57) A weldable austenitic manganese steel joint for railways comprising an austenitic manganese steel member, including manganese 11.5 to 19% by wt, carbon 0.6 to 0.95% by wt, secured by a first weld to a bainitic steel insert, including boron up to 0.01% by wt, molybdenum 0.2 to 3% by wt, manganese 0.3 to 3% by wt, and of relatively short length secured by a second weld to a pearlitic steel member, with heat from the second weld being transferred via the insert to the first weld thereby tempering the first weld.

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This invention relates to a joint for the rails, frogs etc., of a railways, tramways, light rail transit systems etc., all hereinafter collectively referred to as a "railway(s)", and to a method of manufacturing such a joint.

The advantage is self-evident of inserting a component of high wear resistant, but relatively expensive, steel - conventionally an austenitic manganese steel - at a location of anticipated high wear e.g. at a crossing or frog. Mechanical connections, usually involving fish plates, have been used to secure such austenitic manganese steel components in position, but with the increasing installation of continuously welded rail, there is an increasing demand for an austenitic manganese steel crossing etc., capable of incorporation, by welding, in continuously welded rail track. However, austenitic manganese steel cannot be welded directly to pearlitic steel due to the composition and the differing heat treatments necessary to obtain the properties required of a railway rail. Consequently, the practice has evolved of interposing an insert of a third steel of composition that is weldable to both austenitic manganese steel and to pearlitic steel. One known proposal is for the insert to be of austenitic stainless steel, but being high in Cr and Ni this is relatively expensive and is not the simplest of materials to weld. Also, other proposals have involved the need to effect a pre or post heat treatment e.g. at 350 °C to 1000 °C, to refine and temper the weld to provide enhanced fatigue resistance.

According to a first aspect of the present invention, there is provided a weldable austenitic manganese steel joint for railways comprising;

(i) an austenitic manganese steel member, including

manganese	11.5 to 19% by wt
carbon	0.6 to 0.95% by wt,

secured by a first weld to

(ii) a bainitic steel insert, including

boron up to	0.01% by wt
molybdenum	0.2 to 3% by wt
manganese	0.3 to 3% by wt

and preferably including

copper	up to 6% by wt
nickel	up to 6% by wt
chromium	up to 6% by wt,

and of relatively short length secured by a second weld to

(iii) a pearlitic steel member, with heat from the second weld being transferred via the insert to the first weld thereby tempering the first weld.

Thus, in accordance with the invention, a weldable austenitic manganese steel joint for railways is provided that is not only easily weldable by the use of the relatively cheap bainitic insert, but which advantageously also avoids the need for any pre or post heat treatment.

Clearly, for the joint to form a railway joint, then the bainitic insert needs to have the same industry-standard rail profile as a rail of pearlitic steel and a rail of manganese steel. For insertion in a frog etc., again the insert needs to have a matching profile.

A second aspect of the invention is directed to a method of manufacturing such a joint.

All welding is preferably effected in a flash butt welding machine, whereby close monitoring and control of the welding parameters can be made.

Claims

1. A weldable austenitic manganese steel joint for railways comprising;
   (i) an austenitic manganese steel member, including

manganese	11.5 to 19% by wt
carbon	0.6 to 0.95% by wt.

secured by a first weld to
(ii) a bainitic steel insert, including

boron up to	0.01% by wt
molybdenum	0.2 to 3% by wt
manganese	0.3 to 3% by wt

and preferably including

copper	up to 6% by wt
nickel	up to 6% by wt
chromium	up to 6% by wt,

and of relatively short length secured by a second weld to
(iii) a pearlitic steel member, with heat from the second weld being transferred via the insert to the first weld thereby tempering the first weld.

2. A joint as claimed in Claim 1, wherein the bainitic steel insert is a length of rail of industry-standard profile.

3. A method of manufacturing the joint defined in Claims 1 and 2, comprising welding
(i) an austenitic manganese steel member, including

manganese	11.5 to 19% by wt
carbon	0.6 to 0.95% by wt.

to one end of
(ii) a bainitic steel insert, including

boron up to	0.01% by wt
molybdenum	0.2 to 3% by wt
manganese	0.3 to 3% by wt

and preferably including

copper	up to 6% by wt
nickel	up to 6% by wt
chromium	up to 6% by wt,

and of relatively short length, and then welding the other end of the bainitic steel insert to
(iii) a pearlitic steel member, with heat from the second weld being transferred via the insert to the first weld thereby tempering the first weld.

4. A method of manufacturing the joint defined in Claim 3, wherein welding is effected by a flash butt welding machine.

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EUROPEAN SEARCH REPORT

Application Number
EP 93 20 3461

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.5)
A	EP-A-0 070 774 (CREUSOT-LOIRE) 26 January 1983 *Claims*	1-5	C22C38/00 B23K35/00 E01B7/12
A	PECKNER AND BERNSTEIN 'Handbook of Stainless Steels' 1977 , MCGRAW HILL BOOK COMPANY , US *4-16, 4-17, 26-8, 26-9, 26-10*	1-5	
A	US-A-5 041 174 (FERNAND PONS) 20 August 1991 *Claims*	1-5	
A	EP-A-0 260 233 (BREDA FUCINE MERIDIONALI S.P.A.) 16 September 1986 *Claims*	1-5	
A	EP-A-0 213 111 (VOEST-ALPINE A.G.) 4 March 1987 *Claims*	1-5	
A	GB-A-1 552 392 (VEREINIGTE ÖSTEREICHISCHE EISEN- UND STAHL WERKE - ALPINE MONTAN A.G.) 12 September 1979 *Claims*	1-5	
A	EP-A-0 181 251 (COMPAGNIE FRANCAISE DE FORGES ET DE FONDERIES) 14 May 1986 *Claims	1-5	

TECHNICAL FIELDS SEARCHED (Int.Cl.5)
C22C
B23K
E01B

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
MUNICH	21 March 1994	Badcock, G

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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A : technological background
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E : earlier patent document, but published on, or after the filing date
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